

DWR OROVILLE FACILITIES RELICENSING PROJECT (FERC Project No. 2100)

STUDY #1D: THERMALITO COMPLEX TEMPERATURE MODEL DEVELOPMENT

December 12, 2001

1.0 INTRODUCTION/BACKGROUND

Water is released from Oroville Reservoir through Hyatt Powerhouse. A portion of this water is then diverted into the Thermalito Forebay/Afterbay complex and used for power generation purposes before being diverted for agricultural use or returned to the Feather River. While in the Forebay/Afterbay complex the water typically warms due to the large shallow nature of the reservoirs. The agricultural diversions, a large portion of which goes to rice growers require specific temperatures for proper germination and growth. The cold water fishery in the Feather River requires lower temperatures to provide appropriate habitat for the fish. These conflicting temperature requirements make understanding the warming that happens in the Forebay/Afterbay complex critical in performing impact analysis.

2.0 STUDY GOAL(S) AND OBJECTIVE(S)

The goal of this study is to develop a model to estimate the warming between the Oroville Reservoir release temperatures and the Afterbay release temperatures using benchmark simulations. The main concerns are the temperatures released from the east side of Afterbay into the Feather River and the west side of the Afterbay to be used for farming.

3.0 RELATIONSHIP OF THE STUDY PLAN TO RELICENSING PROJECT PROCESS/PURPOSE AND NEED FOR THE STUDY

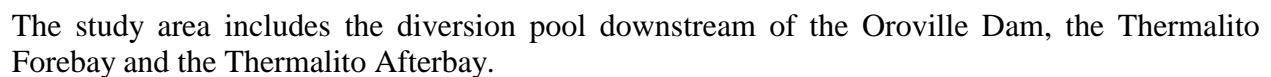
Relationship of the Study Plan to Relicensing Project Process

In order for the Oroville facilities to obtain a new license the Federal Energy Regulatory Commission (FERC) requires water quality certification from the State Water Quality Control Board (SWRCB). The certification requires that SWRCB determine that the project complies with the temperature requirements of the Central Valley Water Resource Control Board (CVWRCB) Basin Plan (SPW1, 01).

Purpose and Need for the Study

Diversions of water for agriculture, particularly rice fields, in-stream fisheries, and the hatchery all have specific, often conflicting, temperature requirements. Rice farmers require warmer temperatures to apply to their rice fields, while fisheries require cold temperatures. Evaluation of

4.0 SCOPE – STUDY AREA



5.0 GENERAL APPROACH

The Thermalito Forebay/Afterbay Complex is hydraulically and thermodynamically diverse. Water is released from the Oroville Reservoir and diverted into the Thermalito Forebay. The water is then released into the Thermalito Afterbay to generate power. Some of the water within the Afterbay may be pumped back to the Forebay and possibly back into the Oroville Reservoir to be reused for power generation. Each portion of the Thermalito Forebay/Afterbay Complex

has different rates at which temperatures can change. Due to the hydraulic and thermodynamic complexity of the Thermalito Forebay/Afterbay it would be extremely difficult to build a numerical model that simulates the system dynamics.

This study plan will attempt to develop an empirical relationship between Oroville Reservoir release temperatures and Afterbay diversion and Feather River release temperatures utilizing historical data. Because of the projected use of the estimated warming that occurs it is preferable that the relationship slightly over estimate the warming over under estimation.

Detailed Methodology and Analysis Procedures

Task 1 – Evaluate existing data

This task will collect all available historical data that could be useful in developing the empirical relationship. Existing data that may be useful includes:

- Diversion pool temperatures
- Afterbay outlet temperatures
- Meteorological data
- Depth to Surface area relationships
- Storage/Volume data

Task 2 – Model Development, Calibrations, and Verification

The actual model development will consist of statistical evaluation of the available data. The appropriate independent parameters and the format of the relationship will be developed and verified using the existing data. Additional data requirement may be identified to enhance the usefulness of the final relationship.

Potential independent parameters include:

- Oroville Release Temperature
- Oroville Release Rate
- Thermalito diversion flow rate
- Thermalito Afterbay Return Flow to the Feather River
- Residence flow time
- Seasonal meteorology

Task 3 – Perform Benchmark Thermalito Temperature Analysis as required

Using the developed model perform the Thermalito Temperature simulations required for the 2001 and 2020 Benchmark Studies.

6.0 RESULTS AND PRODUCTS/DELIVERABLES

Results

The results of this study will include a document of the analysis used to determine the empirical temperature relationship within the Thermalito Complex.

Products/Deliverables

The product will be a temperature model for the estimation of the warming of water in the Thermalito Forebay/Afterbay Complex.

7.0 STUDY PLAN COORDINATION AND IMPLEMENTATION STRATEGY

Coordination with Other Resource Areas/Studies

Engineering and Operation Study Plans

Study Plan No. 1 - Model Development

Study Plan No. 1b - Local Operations Model Development

Study Plan No. 1c - Oroville Reservoir Temperature Model Development

Study Plan No. 1e - Feather River Temperature Model Development

Study Plan No. 2 - Modeling Simulation

Related Water Quality Study Plans: SPW1, SPW6

Related Water Quality Issues: W1-W3, W9-W14, W16

Study Plan Tracking/Regulatory Compliance Requirements

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8.0 REFERENCES

ATTACHMENTS

None